ClearFuels Technology Inc

RENTECH

Advanced Thermochemical Production of Drop in Biofuels

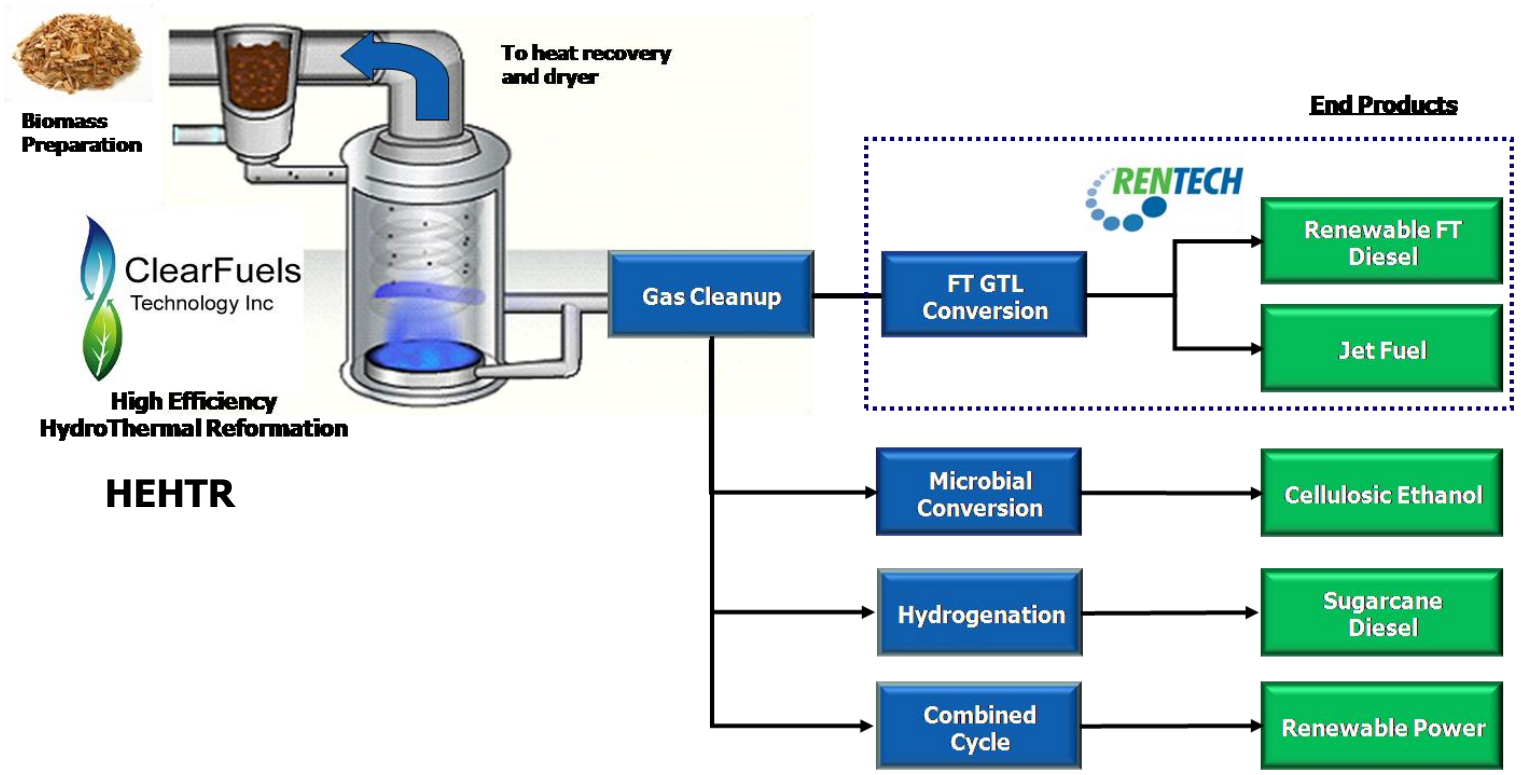
Presented to
Biomass Research and Development Technical Advisory Committee
September 29, 2010

Technology Flexibility for Multiple Advanced Biofuels

ClearFuels focus is developing and operating integrated biorefineries (IBR) that can convert multiple feedstock's and produce multiple biofuels

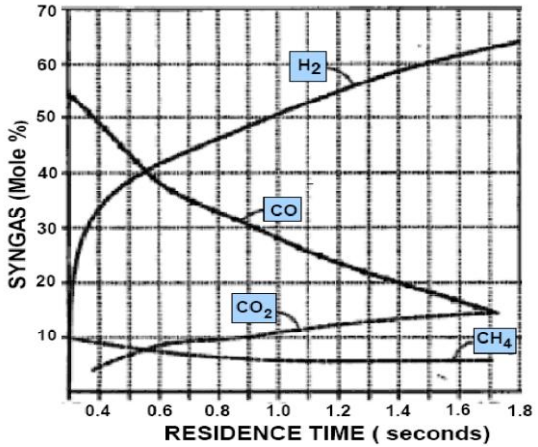
ClearFuels core technology is a flexible, versatile thermochemical conversion process for producing clean controllable syngas, hydrogen, steam and power

First ClearFuels IBR project is with Rentech's proven FT technology for versatile production of advanced drop in diesel and jet fuel from woodwaste and bagasse



Technology Differentiation of ClearFuels HEHTR

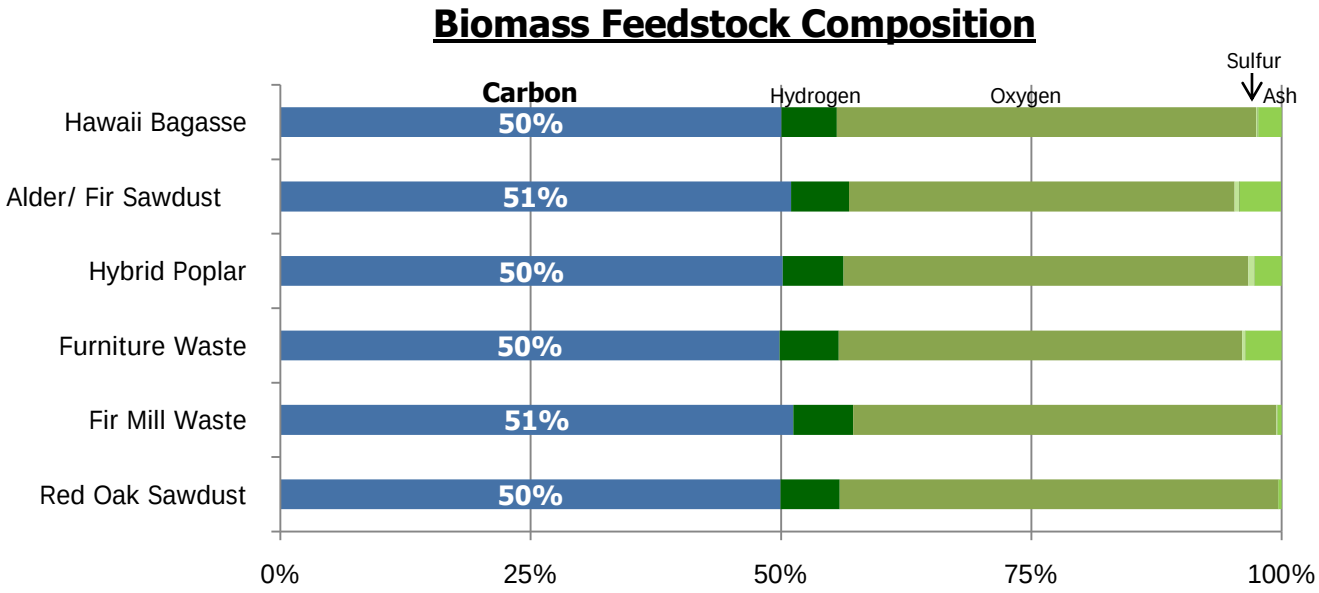
CONTROLLABLE H2:CO SYNGAS RATIO THROUGH OPERATIONS



DESIGN	RESULT	ADVANTAGE
Indirect firing	Combustion separate from gasified products	Cleaner syngas with low tar content
Steam reformation	No oxygen plant no nitrogen dilution	Lower capex and opex
Entrained flow	Biomass and steam premixed	Consistent syngas characteristics with multiple feedstock's
Variable controls	Independent control of steam, biomass, residence time	Ability to "dial in" H2 to CO ratio to desired through operations
Flexible fuel	Can use syngas, nat. gas, biogas, tailgas	Higher yields when integrated with other advance biofuels processes

Technology Flexibility for Multiple Feedstocks

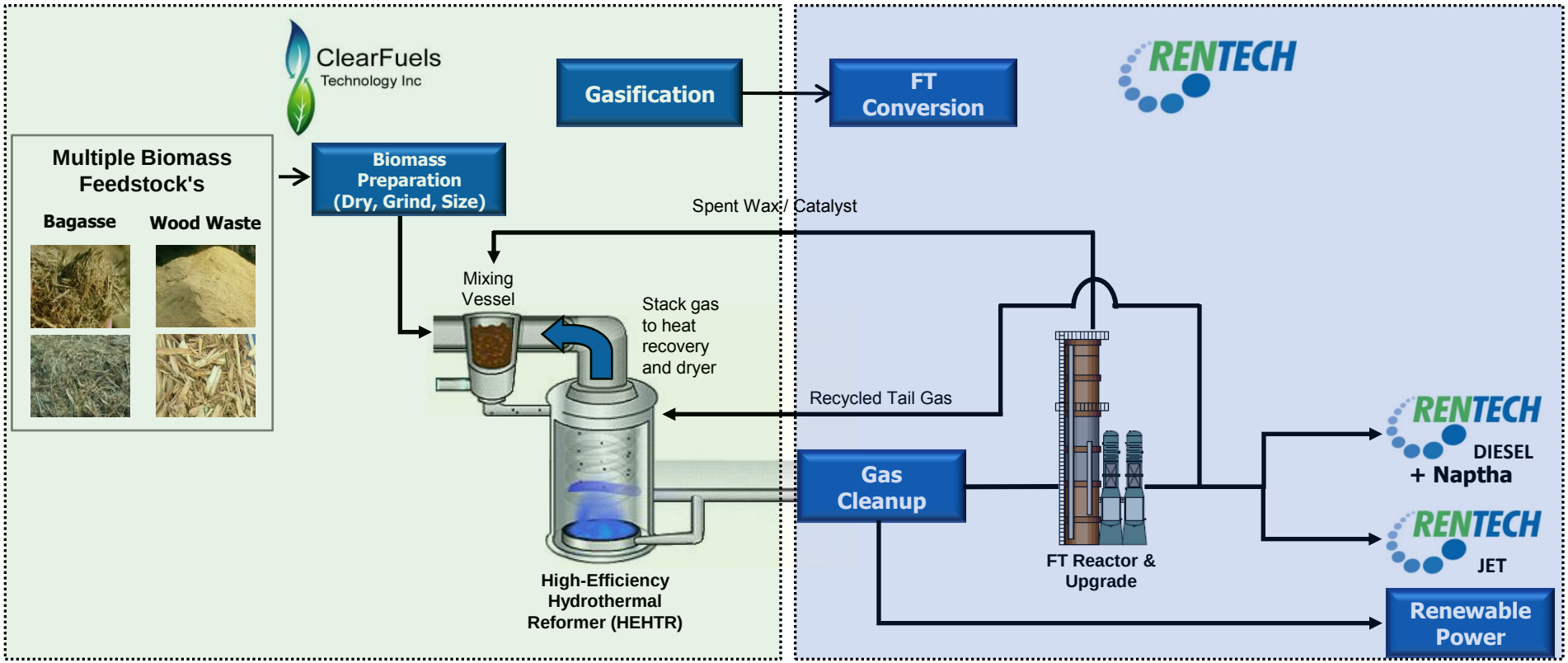
- ClearFuels can process almost any clean source of biomass
- ClearFuels process is based on the carbon content of biomass, which is highly consistent across feedstocks
- Has the capacity to mix / supplement a variety of feedstocks at the same facility without changing design or modifying operations
- Proven over 10 years at 3 separate 5 ton per day pilot plants



Biomass to Renewable Diesel and Jet Fuel Platform

Fully Integrated ClearFuels-Rentech Technology

- ClearFuels integration with Rentech is most efficient, compared by Rentech vs. dozens of other gasification technologies
- Uniquely integrated ClearFuels-Rentech process for conversion of multiple feedstock's at 30% higher yields and lowest capex and opex



Biomass to Renewable Diesel and Jet Fuel Platform

Integrated Technology Colorado Demonstration Facility

- Validates the integration of ClearFuels' and Rentech's already proven technologies
- Rentech's $85 million demo and research center in Commerce City, Colorado has already successfully produced certified diesel, jet fuel and naphtha
- ClearFuels 20 tpd reformer (HEHTR) will substitute for PDU's existing natural gas to syngas reformer; both reformers are from Hydro-Chem
- Will test multiple feedstocks (wood waste, bagasse, mixed feedstocks)

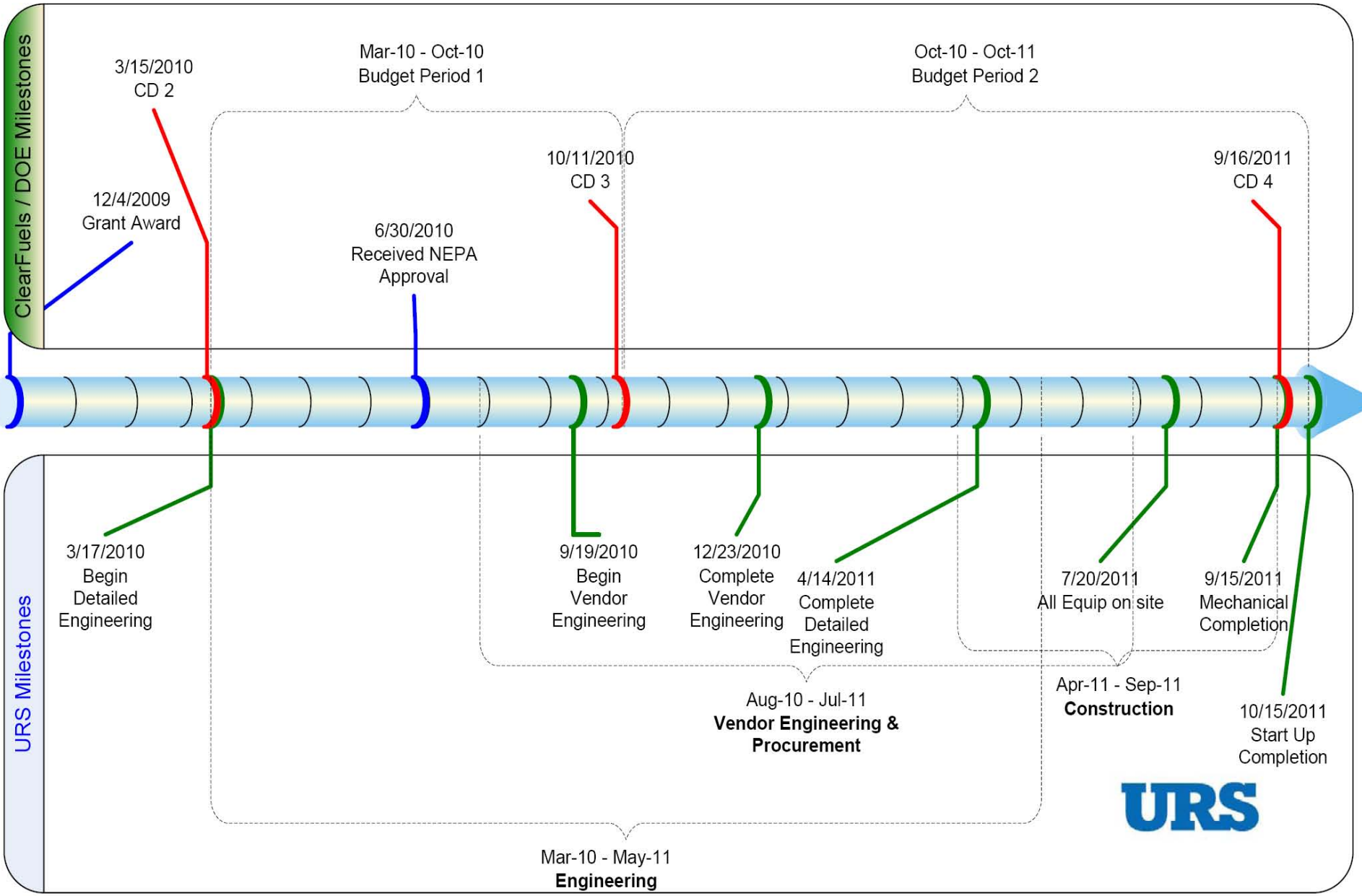
Performance Targets

- Biomass to syngas and steam conversion efficiency of 87%
- Control syngas H_2:CO ratio at 1:1
- Vary H_2:CO ratio from 0.9:1 to as high as 3:1
- Control H_2:CO ratio in increments of +/- 0.2:1
- Tar contaminants < 25 ppm
- Operate integrated biomass-to-diesel process continuously for 30 days (wood waste) and 10 days (bagasse)
- Meet ASTM petrodiesel and biodiesel standards

Project Status

- **DOE-EERE**
- **Project Title:** Recovery Act: ClearFuels-Rentech Integrated Biorefinery Pilot Project for Diesel and Jet Fuel Production by Thermochemical Conversion of Woodwaste
- **Award Number:** DE-EE0002871
- **Award Amount: $23MM**
  - **BP 1 - $2.88MM - Received**
  - **BP 2 - $20.12MM – Requested (Under Review)**

IBR Project Timeline



Project Status (cont)

Operation Plan

- Wood Chips Only
- Bagasse Only
- 50/50 mixture of Wood Chips and Bagasse

Data Analysis / Validation

Final Retorting

Future Uses

- Support potential Commercial project Development
- Feedstock Demonstration

Piloting, Demonstration, and Commercialization

- Rentech
  - Sterling – Small Scale Catalyst Production.
  - Zuni – Improvements to Catalyst.
  - Boulder – Scaled up and manufactured 1000's of lbs of catalyst.
  - Synhytech – Demo / Small commercial unit with public utility using landfill gas as a feed stock. Ft products were 100's of BBL/ day. Largest slurry bubble column in the word at the time and still the largest in the western hemisphere.
  - R&D Center Denver – Small pilot reactor advancement in wax catalyst separation.
  - La Porte – DOE evaluation of large scale bubble column reactor with Texaco.
  - Sand Creek Process Demonstration Unit (PDU) – Fully-integrated demonstration unit producing 1000's of gallons of transportation fuels.
  - Rialto, CA – Currently in FEED
- ClearFuels
  - Aberdeen, Mississippi- Pilot Plant, 10,000 hours with multiple feedstocks.
  - Five commercial projects in Southeast US and Hawaii using CF-RT integrated technology in project development
  - Other ClearFuels technology projects outside of USA

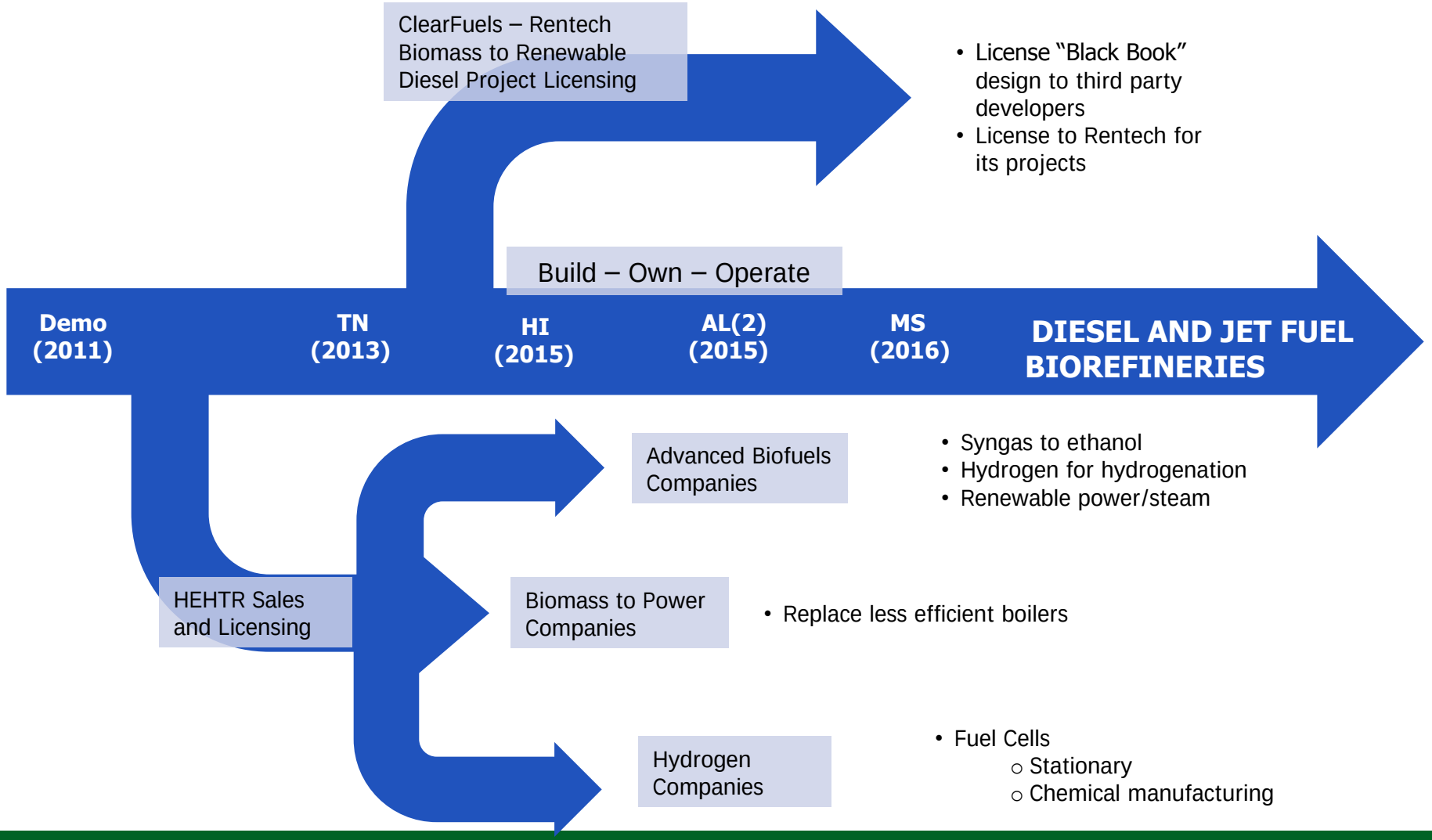
Potential Maui Project at HC&S Sugar Plantation

Study in progress

- 1250 tpd sugarcane bagasse and cane trash to net 18 mgpy renewable diesel (or jet) and naphtha using ClearFuels-Rentech integrated technology
- Power and steam delivery to HC&S for sugarmill operations

- Scoping study with HC&S launched June 2010 to evaluate possible alternatives
- HECO proposal submitted June, 2010
- Additional offtake is jet fuel to military through preliminary GIFTPAC submittal
- Additional expansion possible using ClearFuels-Amyris or other integrated technology for sugar juice to renewable diesel, dependent on sugar prices and other variables for up to 1100 gal/acre

Multiple Pathways for Commercialization of Technology



Path to Commercialization

- Successful Demonstration of Integrated Biorefinery

Current Production	➔ N//2 Facility	➔ Nth Facility
1200 BPD	➔ 1300 BPD	➔ 1400 BPD
Current Selectivity	➔ N/2 Facility	➔ Nth Facility
70% Diesel – 30% Naphtha,+ 7 MW	➔ 75% / 25%	➔ 80% /20%, +2MW

- Capital Cost improvements
- Construction Time
- Internal recycle / optimization loops

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Challenges for commercialization

- Demonstration Project
  - Administrative overhead – diversion of effort
- Commercial Facilities
  - Project financing
  - Feedstock contracting
  - Mandates, credits, subsidies predictability and clarity

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We are not there yet…but the biofuels market is, in any case, further along than before. Thank you for your time.

Thank You

www.clearfuels.com